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METANDROCARPA KUDOI, A NEW COLONIAL ASCIDIAN (STOLIDOBRANCHIA, STYELIDAE) FROM KOREA

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ABSTRACT

A new species of *Metandrocarpa* (Stolidobranchia: Styelidae) is described from Kudo (Koje Islands) . One colony was attached to rock and another was associated with the tunicate *Styela clava*. The zooids of this new species are flattened laterally and not dorsoventrally. This species has 7–8 internal longitudinal branchial vessels on each side, 10–20 oral tentacles of 5–6 different sizes, 14–15 rows of branchial stigmata, and a short rounded plicated stomach with a curved caecum. On the right side, the gonads lie in a row along the endostyle with the ovaries anterior to the testes; on the left side, the ovaries lie along the endostyle with the testes running alongside the intestinal loop.

The large family Styelidae (Sluiter, 1895) is found all over the world. It includes both solitary and colonial forms and is divided into three sub families: Styelinae, Polyzoinae and Botryllinae. The species described here belongs to the subfamily Polyzoinae in which colonies of small but persistent zooids are either joined by stolons or embedded in a common test. Gonads are present on both sides of the body. *Metandrocarpa* differs from other Polyzoinid genera in that its gonads are generally not hermaphroditic, it has separate testes and ovaries on both sides of the body, and its branchial sac has numerous internal longitudinal vessels. This work describes a new species of *Metandrocarpa* and is the first species of this genus to be recorded from Korean waters.

SYSTEMATICS

Metandrocarpa kudoi new species
(Figs. 1–2)

Material examined.—2 colonies. Kudo (Koje Island, 34°47′3″N, 128°32′3″E) in Korea Strait, 6 Feb. 1996, by SCUBA divers, 29–30 m depth, 9–10°C water temperature, attached to rock and associated with *Styela clava.*
Holotype (collection No.ASC. 1-1 960206) is deposited in the National Museum of Natural History, Washington D.C. (USNM 23391)
Paratype (collection No.ASC. 1-2 960206) is deposited in Ewha Womans University, Seoul, Korea.

Description.—The specimens are colonial, and were found attached to rock and sometimes associated with *Styela clava*. The colony in life is cherry-red. A colony consists of an aggregation of bulbous or dome-shaped zooids 4 to just over 6 mm in diameter (Fig. 1A). Though zooids are densely packed, they are easily distinguishable from each other. Zooids are pear-shaped, flattened laterally with larger ones up to 6.5 mm in length. Tunic surface is smooth in life, but becomes wrinkled when preserved in formalin. Both zooidal apertures are conspicuous, short, wide round openings that lie close to each other at the anterior end of the zooid. The tunic of formalin-preserved specimens is leathery and thin.

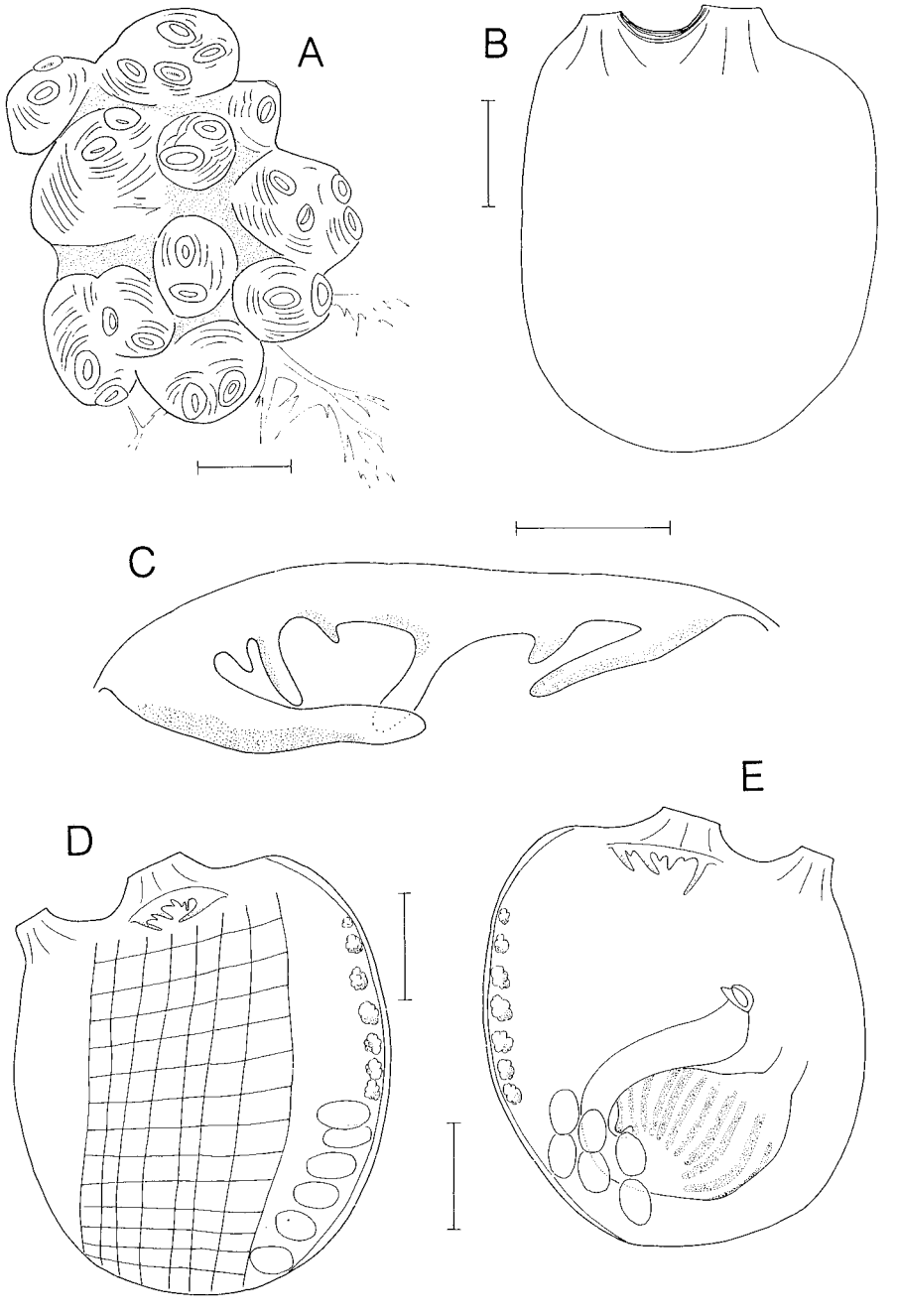

Figure 1. *Metandrocarpa kudoi* n.sp. A. part of colony; B. mantle musculature; C. tentacles; D. right side of body showing gonads; E. left side of body showing gonads.

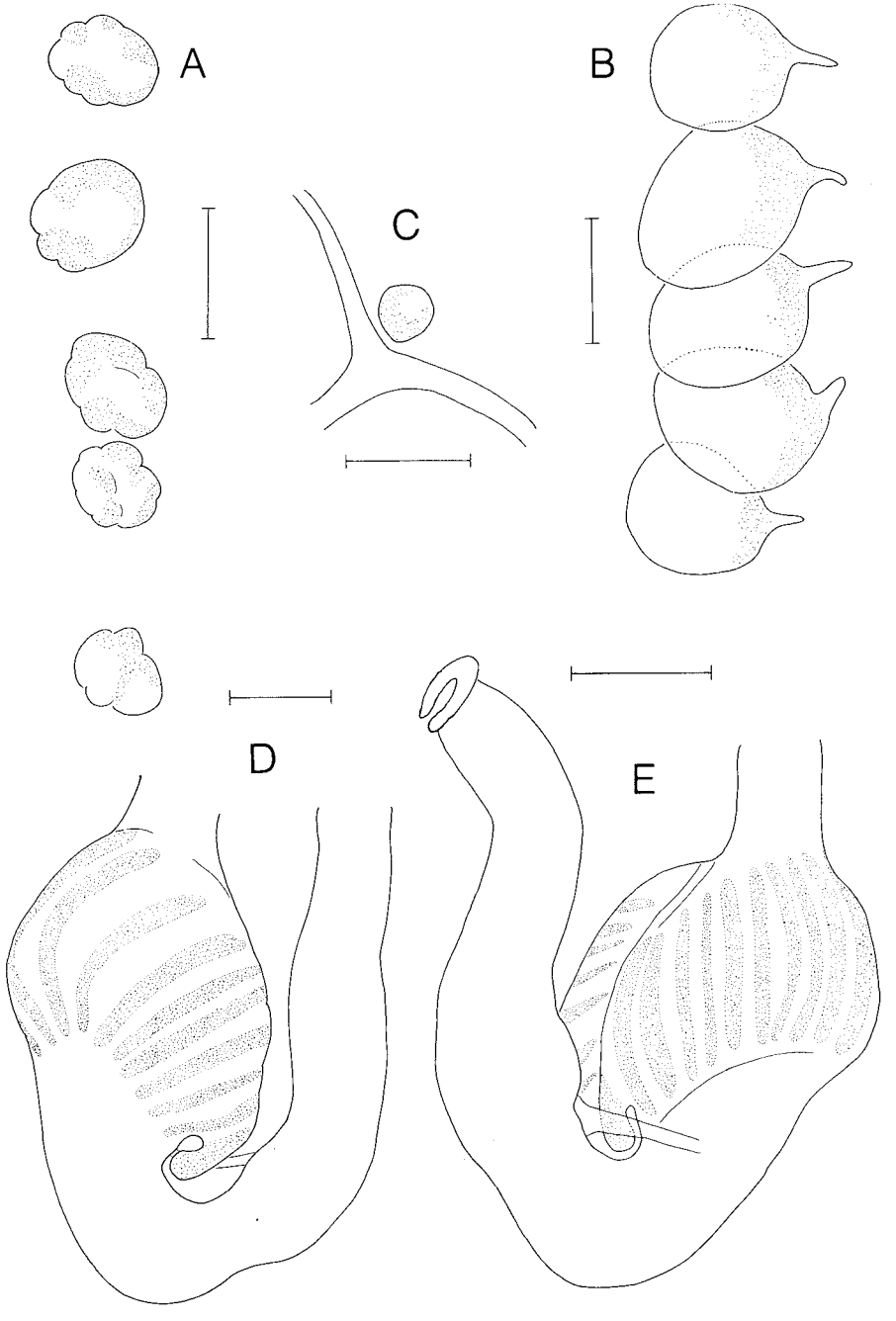

Figure 2. *Metandrocarpa kudoi* n. sp. A. ovaries; B. testes; C. dorsal tubercle; D,E. stomach and gut loop.

The mantle is dull brown, thin and transparent enough to reveal internal organs. There is very little mantle musculature, but some longitudinal muscle bands extend down each siphon and across the space between the siphons; muscle bands extend only to the base of the siphons (Fig. 1B).

There are approx. 17–20 thick, unbranched branchial tentacles of 5–6 different sizes (Fig. 1C) arranged in two rows. The dorsal tubercle is a small oval opening (Fig. 2C); the dorsal lamina is a smooth membrane with no languets. In larger zooids, the branchial sac has 8 internal longitudinal vessels on each side with 5–7 stigmata per mesh, 7–8 vessels in the smaller ones. The branchial sac has no folds. There are 13–15 rows of stigmata on each side of the branchial sac that are crossed by parastigmatic transverse vessels.

The gut forms a short and compact loop. The esophagus is short, and the stomach is short and barrel shaped or rounded with 18–20 prominent plications. The stomach has a curved caecum. A tight post-abdominal curve causes the wide intestine to lie close to the stomach (Fig. 2 D,E). The rectum narrows toward the anus, which opens at the 7th stigmatal row; rim of the anus is thick, smooth and bilobed.

The gonads are found on both sides of the body. Ovaries are anterior to the testes.The gonads on the right side of the body are arranged in a row along the endostyle. On the left side, the ovaries are in such a row, but and testes all lie near the base of the intestine (Fig. 1D,E). Ovaries are roundish, testes are pear-shaped (Fig. 2A,B). The number of ovaries varies from 4–7, testes from 6–8 on each side. Each testes has a short, slender vas deferens that opens into the peribranchial chamber. Ovarian apertures were not visible.

Etymology.—The name *kudoi* comes from the collection locality.

Remarks.—We compare our species with known species of *Metandrocarpa* (see Table 1). *Metandrocarpa kudoi* is very similar to *Metandrocarpa uedai* Watanabe and Tokioka, 1972, collected from Japanese waters; the tunic surface of which is also very wrinkled when preserved. However, the two species differ in that *M. uedai* flattens dorsoventrally, has only six internal longitudinal vessels, only 8–9 rows of branchial stigmata, and fewer gonads on each side.

The general morphology of our species is the same as that of *M. dura* (Ritter, 1896) and *M. taylori*, Huntsman, 1912, but these Pacific North American species have only five internal longitudinal vessels on each side.

Other similar species, *M. protostigmatica* (Michaelsen, 1922) from New Zealand, has eight internal longitudinal vessels on each side of the branchial sac and similarities to *M. kudoi* in the digestive tract, but *M. kudoi* is distinguished from it by the number, position and arrangement of ovaries and testes on each side. As well, *M. protostigmatica* has 10–11 rows of branchial stigmata, but *M. kudoi* has 14–15 rows (see Table 1). *M. indica*, Kott, 1972 from South Australia is similar externally, including the arrangement of zooids in the colonies. Both species consist of aggregations of dome-shaped zooids, but there are differences internally. *M. indica* has fewer internal longitudinal vessels in the branchial sac and fewer rows of stigmata; the stomach has fewer plications and the dorsal tubercle is different.

The Australian species *M. miniscula* Kott, 1985 and *M. agitata* Kott, 1985 are quite different from *M. kudoi*. *M. miniscula* is different in that it has a very granular tunic, fewer internal longitudinal vessels on each side of the branchial sac, fewer gonads that are not arranged in a row along the endostyle. The zooids of *M. agitata* are more upright and elongated than those of *M. kudoi*, have only one size tentacle in the branchial sac, and one of the most obvious differences, two folds in the branchial sac. Also the ovaries and testes

Table 1. Comparison of *Metandrocarpa kudoi* n. sp. with known *Metandrocarpa* species.

Species	Zooid Form	Type Localities	Internal Longitudinal Vessels	Rows of Stigmata	Stomach Plications	Tentacles	Dorsal Tubercle	Gonads left (female)	Gonads right (male)
M. dura	dorso-ventrally flattened	Southern California	5	12	12–16	40	longitudinally elliptical	4	6
								3	5
M. taylori	dorso-ventrally flattened	Southern California	4–5	9	12–17	30–40	S-shaped	3	3
								4	5
M. protostigma	dorso-ventrally flattened	New Zealand	8	10–11	16–18	16	small oval	3	4
								2	0
								1 hermaphrodite	
M. kudoi	laterally flattened	Korea	7–8	14–15	18–20	17–20	small oval	6	6
								8	7
M. uedai	dorso-ventrally flattened	Japan	6	8–9	15	16	oval	3	3
								2	4
M. miniscula	Slightly dorso-ventrally flattened	Queensland, Australia	4	8	8	10–20	oval	2	2–3
								1	1–3
M. agitata	laterally flattened	Western Australia	6–7	17	15	20	small oval	7	6–7
								7–8	7–8
M. Manina	dorso- ventrally flattened	Tahiti	6–8	8	9	12–13	round to oval	3–4	3–4
								1–2	1
M. rnanina reducta	some laterally flattened, some round	New Caledonia	4	6–7	9	12–13	round to oval	3	3
								0–1	1
M. sterreri	dorso-ventrally flattened	Bermuda	7–8	8	10–12	8	small round to oval	2	2- possibly
								1	1
M. indica	laterally flattened	South Australia	4	9–10	6	12	longitudinal slit	none observed	none observed

of *M. agitata* lie some distance from each other and they are not alligned in a row along the endostyle.

M. manina Monniot & Monniot, 1987, from Tahiti has fewer rows of stigmata, about half the number of plications in the stomach, and fewer gonads that do not lie in a row. The shape of testes and ovaries is different than those of *M. kudoi*. Ovaries are in small clumps and testes are lobed and not pear shaped as are those of *M. kudoi*. *M. manina reducta* Monniot, 1988 has a similar bilobed anus and branchial tentacles of several sizes as in *M. kudoi*, but *M. manina reducta* has fewer internal longitudinal vessels, a wider stomach with about half the number of plications and there are fewer gonads. Also, the arrangement of the gonads of *M. manina reducta* is very different from *M. kudoi*; the ovaries are not aligned in a row and when there is a testes present, it lies nearly parallel to the ovaries.

M. sterreri Monniot, 1972, from Bermuda has zooids that are about half the size of zooids of *M. kudoi*, has half the number of branchial tentacles and nearly half the number of rows of stigmata in the branchial sac. *M. sterreri* has nearly the same number of longitudinal vessels, but fewer gonads.The shape of the testes is lobed and not pear-shaped like those of *M. kudoi*. The species described in this work does not appear to fit any previous description, and is hence considered to be a distinct species.

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